

FRENCH REPUBLIC

INDUSTRY MINISTRY

INDUSTRIAL PROPERTY SERVICE

## PATENT OF INVENTION

P.V. No. 807.543

N° 1.246.888

International Classification C 06 e

### Electric detonator

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Application on October 15, 1959 at 2:07 PM in Paris

Granted on October 17, 1960

*(The granting of this patent of invention was postponed in pursuance of article 11, § 7, of the law of July 5, 1844 modified by the law of April 7, 1902).*

It is known that an electric detonator is created by the combination of a detonator with an electric igniter. The latter generally consists of a very fine metal filament coated with a substance that is sensitive to heat, attached, either directly to the extremities of the two conductor wires of the detonator, or to the two poles of an armature constituting the igniter itself. In the latter case, the igniter is connected by welding to the conductor wires of the electric detonator.

The object of the present invention is to improve electric detonators of this type and aims in particular to make these detonators easier to use.

An electric detonator according to the invention of a type comprising, in a metal housing, an explosive charge where a detonation is caused by the ignition of an igniter, the latter being connected through an insulating cap with two conducting rods, which is noteworthy in that the electrical coupling devices connected to the igniter are housed in the insulating cap and are adapted to engage with complementary devices mounted on the ends of the conducting rods in a removable plug.

The characteristics and advantages of the invention will emerge from the following description of the detonators realised according to the invention, given solely by way of example, with reference to the appended drawing in which:

Figure 1 illustrates, for the purpose of facilitating understanding of the invention, an electric detonator of an ordinary model;

Figure 2 shows in longitudinal section, a form of embodiment of a detonator according to the invention with its electrical connection plug;

Figures 3 and 4 represent respectively, also in longitudinal section, two variants of detonators according to the invention.

To facilitate the understanding of the invention, figure 1 depicts a regular electric detonator which provides in a casing 1 an explosive charge 2, the detonation of which is controlled by the ignition of an electrical igniter 3. Electrical lead wires 5 to this igniter go through an insulating cap 6 set in the end of the detonator and extend outside the detonator by means of variable length rods 7.

On the contrary, in detonators according to the invention represented in figures 2, 3 and 4, also comprising a casing 1, a charge 2, an igniter 3 and an insulating cap 6, the electrical lead wires 5 to the igniter terminate in electrical connectors attached to the insulating cap.

Electric rods 8 similar to rods 7 lead to electric plugs complementary to those of the detonator, and housed in an insulating plug 9 designed to cap the extremity of the detonator equipped with insulating cap 6.

Referring more specifically to figure 2, the two leads 5 are attached to two female sockets 10 housed in cap 6, while rods 8 are connected to male plugs 11 that are complementary to the female sockets. These plugs 11 are housed in the cavity of plug or cap 9, and by connecting items 10 and 11, the electrical connection is made between the igniter and rods 8.

In figure 3, it is plug 6 of the detonator that is equipped with the male plugs 13, with cap 9 receiving the complementary female sockets 14.

Finally, in figure 4, insulating cap 6 of the detonator and the base of cap 9 both have contacts, consisting of a central contact 15 and 16 respectively, surrounded by an annular contact 17 and 18 respectively.

Contacts 15 and 16 on the one hand, and 17 and 18 on the other hand are designed to come into contact with one another by attaching the detonator cap, which makes the electrical connection between the igniter and rods 8.

Cap 9 can be pushed into the associated detonator or, for example in the case central contacts similar to those in figure 4, this cap may be fitted with a bayonet locking device.

As a result of these arrangements, rods 8 equipped with their cap 9 can be separated from the detonators during transportation.

This is particularly advantageous when electric detonators must be fitted with very long rods, for example in the case of pyrotechnics intended for seismic research.

It is a fact that in order to ensure handling, transportation and conservation of detonators under the best conditions of safety, national and international regulations require that the charges that are packaged in units are limited and the charges transported must be split. The consequences of these measures have an impact on transportation costs which increase considerably. In an ordinary detonator the weight depends above all on the length of the rods, since the weight of the detonator itself is in the order of a few grams, while a metre of rod weighs 7 to 8 g.

In the case of detonators according to the invention, only the detonators without rods are subject to the above regulations, transportation weights are reduced and the storage options are increased. This results in a significant saving, further increased by the fact that the rods with their plugs can be transported without special precautions and at much lower cost.

In addition, for certain shot firing patterns, it may be advantageous to use rods of different lengths. The implementation of these special shot firing patterns will be facilitated by the use of the device according to the invention.

The present invention is of course not limited to the forms of embodiment described and represented, which have been given only by way of example, but instead embraces diverse variants that can be realised without deviating from the scope of the invention,

for example by altering the shape of the removable plug, its attachment to the detonator, etc.

## **SUMMARY**

An electric detonator of a type having, in a metal housing, an explosive charge with a detonation caused by the ignition of an igniter, the latter being connected through an insulating cap with two conducting rods, which is noteworthy in that the electrical coupling devices connected to the igniter are housed in the insulating cap and are adapted to engage with complementary devices mounted on the ends of the conducting rods in a removable plug.

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